Movement Ecology Lab Exercise
Mammalogy Course
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North Carolina State University
2013

Lab Exercises

1. Road crossing time for all animals *[Google Earth]*
2. Possum Start/end activity from ACC
3. Male Raccoon Start/end activity from ACC
4. Female Raccoon Start/end activity from ACC
5. ODBA Over time *[excel & pivot]*
6. Distance moved per night, over time *[excel & pivot]*
7. Interactions between individuals.
8. Plot den sites (daytime locations)

1. Road Crossings

- Question: What time of day do animals cross the roads?
- Methods:
  - Download google earth data in 1-week intervals starting 8/26/13 for each animal .
  - Step through animals nightly tracks slowly
  - Identify crossings, note 'local time stamp', estimate time f crossing
  - Record data in excel sheet
- Results:
  - Create Google map with color coded dots showing interesting patters (species/time etc…)
  - Make a graph showing your results

2, 3, 4, Start and End of Activity

- Question: what time of day do the animals start and end their activity period?
- Methods:
  - Download ACC Viewer, be sure to update Java, run program. https://www.3dyne.com/movebank-acceleration-viewer/download/
  - Within Program, Download data from tag id:
  - Login
  - Zoom in/out, note start/end of activity for each night of activity (float cursor over cell and note date_time in bottom left), record in excel. Note time is UTC, but excel is set up to convert to EST
  - Type in sunset/sunrise times for each date (suggest on separate laptop) note daylight savings time (+1hr) and get from http://aa.usno.navy.mil/data/docs/RS_OneYear.php
  - Note any extensive daytime activity
- Results
  - Graph Start time and sunset over time
  - Graph end time and sunrise over time
  - Graph active time period length over time

5. Energy Expenditure over time

- Question: how does the energy expenditure/activity level vary over time?
- Methods
  - Download ACC Viewer, be sure to update Java, run program. https://www.3dyne.com/movebank-acceleration-viewer/download/
  - Within Program, Download data from tag id:
  - Login
  - Experimental/export ODBA, save file, open in excel
  - Make day, hour, and day_hr column in excel (cut_paste excel blue text)
  - Use excel Crosstabs to calculate average values per day, hour, and day_hr. cut/paste these values into a new worksheet.
  - Repeat for all 3 animals
- Results
  - Graph average daily odba over time.
 - Graph average hourly odba over time
  - Graph averge day_hr odba over time
  - Bonus, plot hourly averages for each day as separate lines on the same graph

6. Distance moved per night

- Question: How far did the animals move per night.
- Methods
  - Download data from Movebank as excel
  - Delete all rows missing location data
  - Sort by animal, then 'local timestamp'
  - Use UTM coordinates & Pythagorean's theorem to calculate the distance moved in each time step.
  - Make day, hour, and day_hr column in excel (blue text in odba worksheet)
  - Use excel Crosstabs to calculate average values per day, hour, and day_hr. cut/paste these values into a new worksheet.
  - Repeat for all 3 animals
- Results
  - Graph average daily movement rate over time.
  - Graph average hourly movement rate over time
  - Graph averge day_hr movement rate over time

7. Interactions between animals

- How often, and where, do animals interact
- Methods
  - Download from: http://web.engr.illinois.edu/~klei2/movemine/
  - Run the the file: MiningToolsFx.jar
  - Login:
  - Select NCSU Campus Carnivores, Download from server
  - Set Gap(min) 15, ThreshGap(hr) 2
  - Click Mining/ Distance Calculation, save image (png) and data (csv). Look at data
  - Click mining/significance. Keep 100 rounds of simulation, try 20, 50, 100, 250m. Save the ones you think are meaningful.
  - Click mining/plot trajectories. Get KML file. Try each pair of individuals. Start with 25m and 30min, then try other variations.
  - Open KML's in Google Earth, save interesting maps.
- Results
  - Distance and significance matrices
  - Screen/shots telling main results of interaction sites

8. Den Sites

- Question: where do animals spend the day?
- Methods
  - Download data from Movebank as excel file
  - Make a new column for hour using local time
  - Load data into GIS as shape file
  - Make map showing results
  - Summarize results per animal (# of dens) and per den site (# of visit)
- Results
  - Map(s) showing dens
  - Graphs showing summary statistics

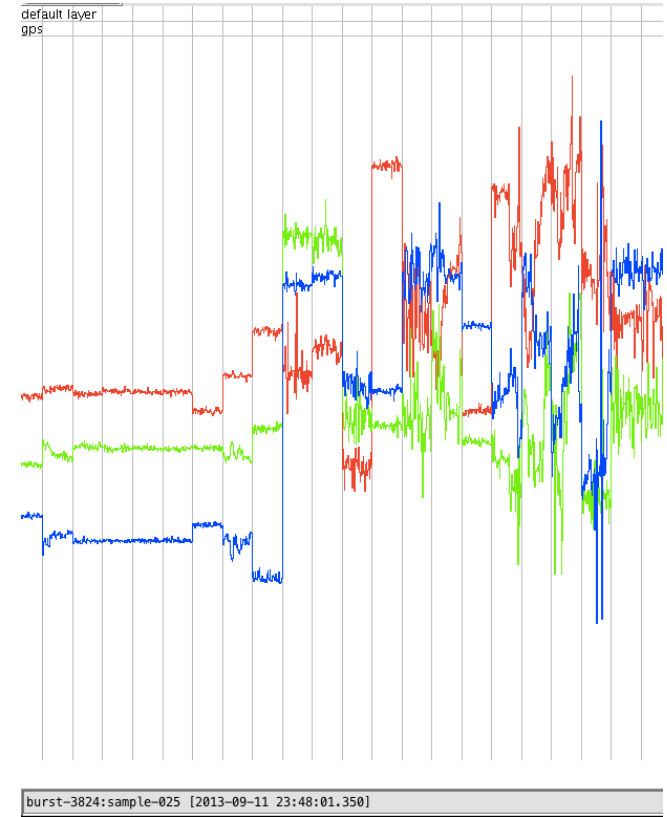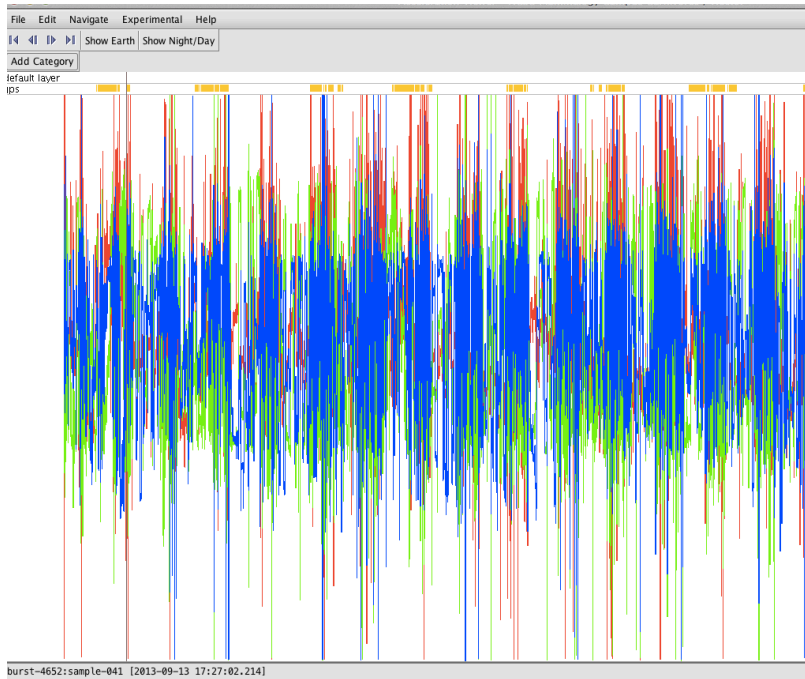# Movebank Download
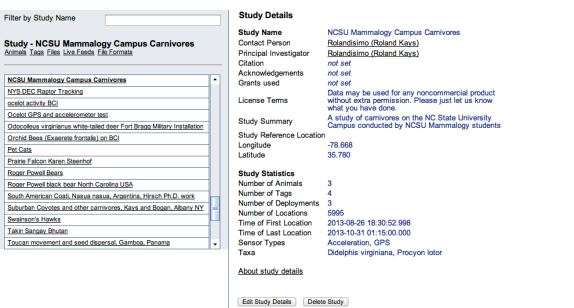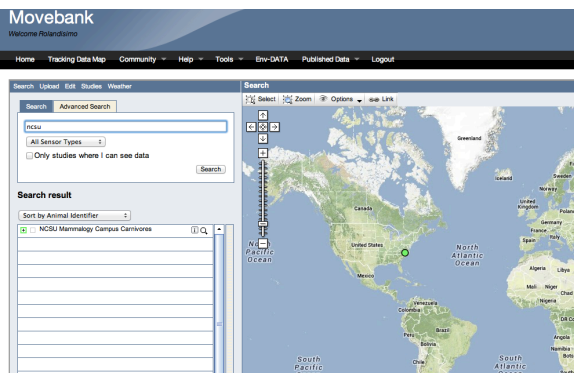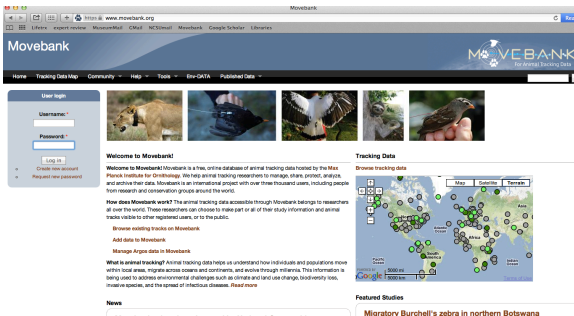
1.

Movebank.org
Click the Map

2.

Search NCSU
Click magnifying
glass to zoon
Click + to open
animals
Check options

3.

Click the i button
'studies page'
Has dates,
overview
Go back to map
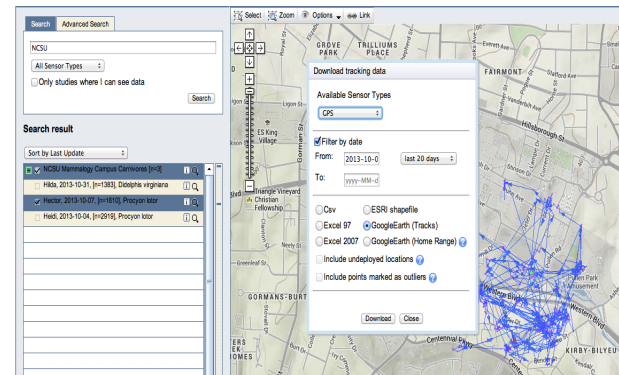
4.

I button
Download
Select data type, download type,
date range

ACC How To

burst-4652:sample-041 [2013-09-13 17:27:02.214]

burst-3824:sample-025 [2013-09-11 23:48:01.350]

- Red/Blue/Green shows x/y/z axes accelerometer values
- Yellow bars at top show where GPS data is collected
- Mouse wheel to zoom in/out
- Click/Drag to move right/left
- Zoom in to see gray bars showing separate bursts
- Float cursor over data to see date/time in bottom left, in UTC

Google Earth How To

Use +/- to zoom in/out on time scale

Move front & rear slider to control how many dots are shown at once
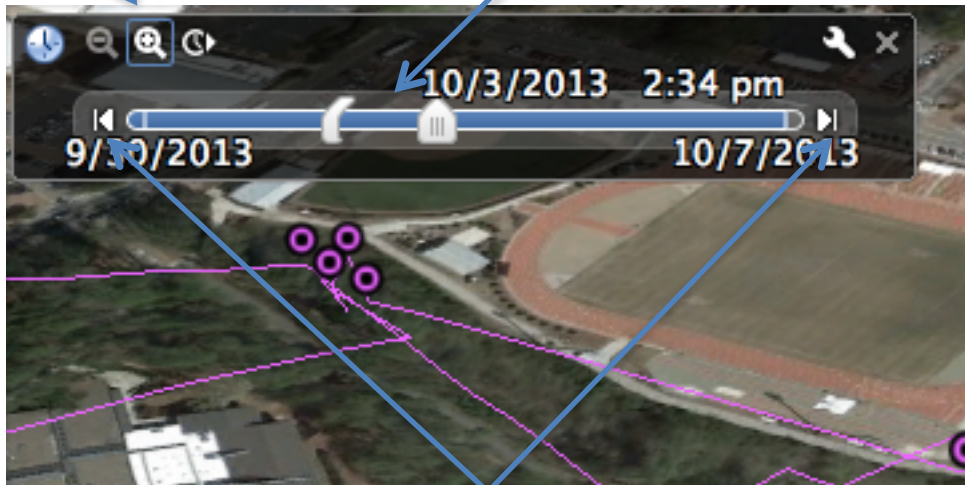
Use forward & reverse arrows to move forward/ backward in time steps (step length will depend on zoom level)

These are our results from 2013

Hector's Homerange

95%
50%

Kirby-Bilyeu

© 2013 Google

Google

Heidi's Homerange

Hilda's Homerange
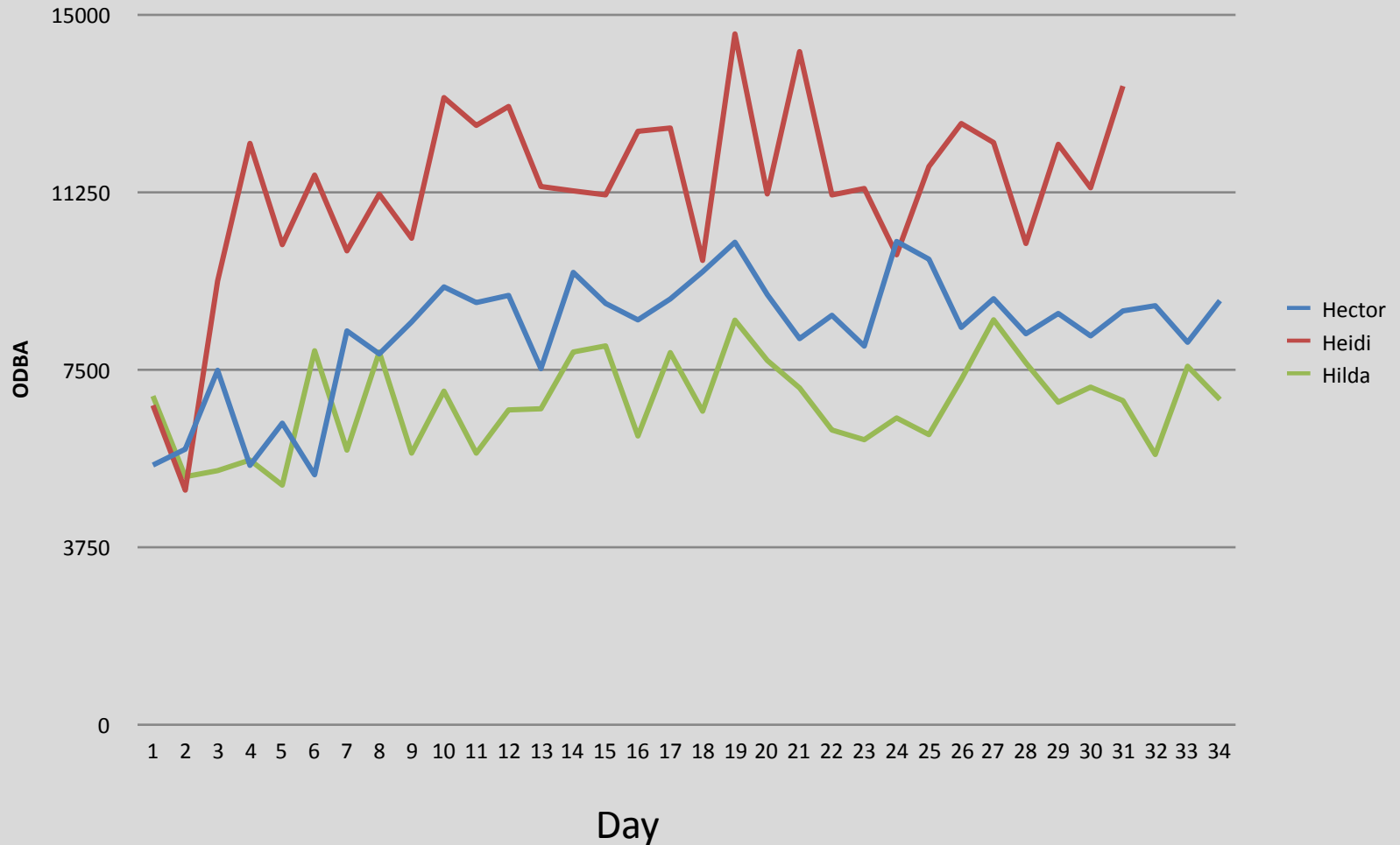
Daily energy use per day over the course of the study. Interesting to see the different overall values between the three animals, and also the few days adjustment at the beginning after the anesthesia (day 1)

Accelerometer Data:
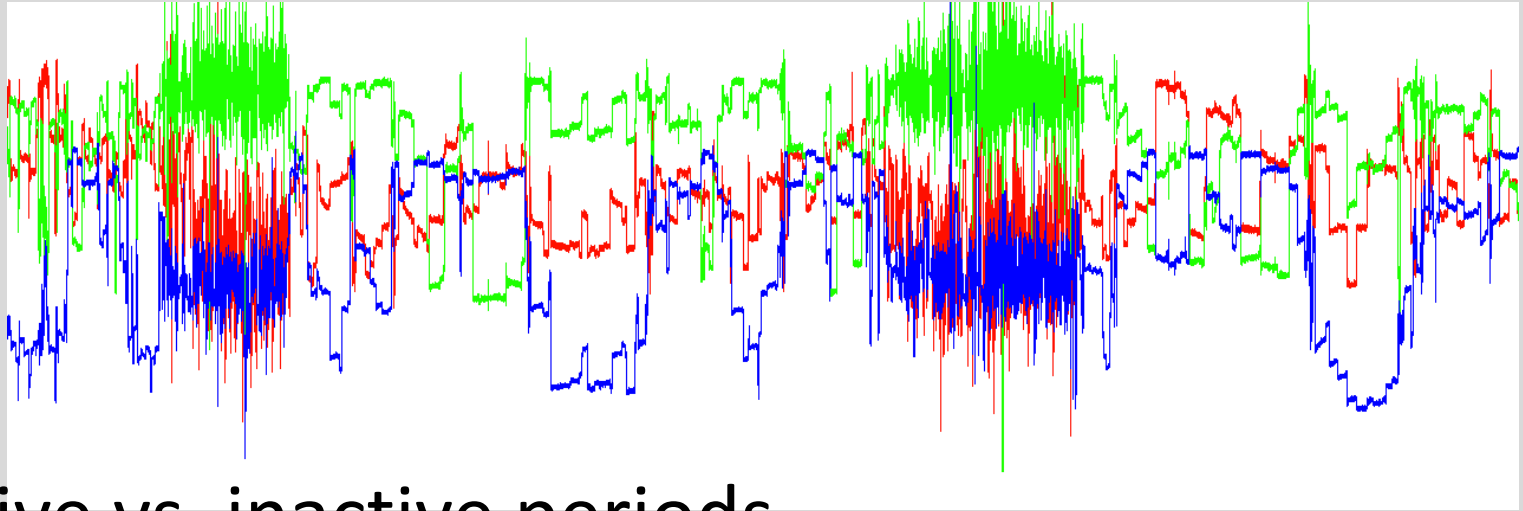
Active vs. inactive periods
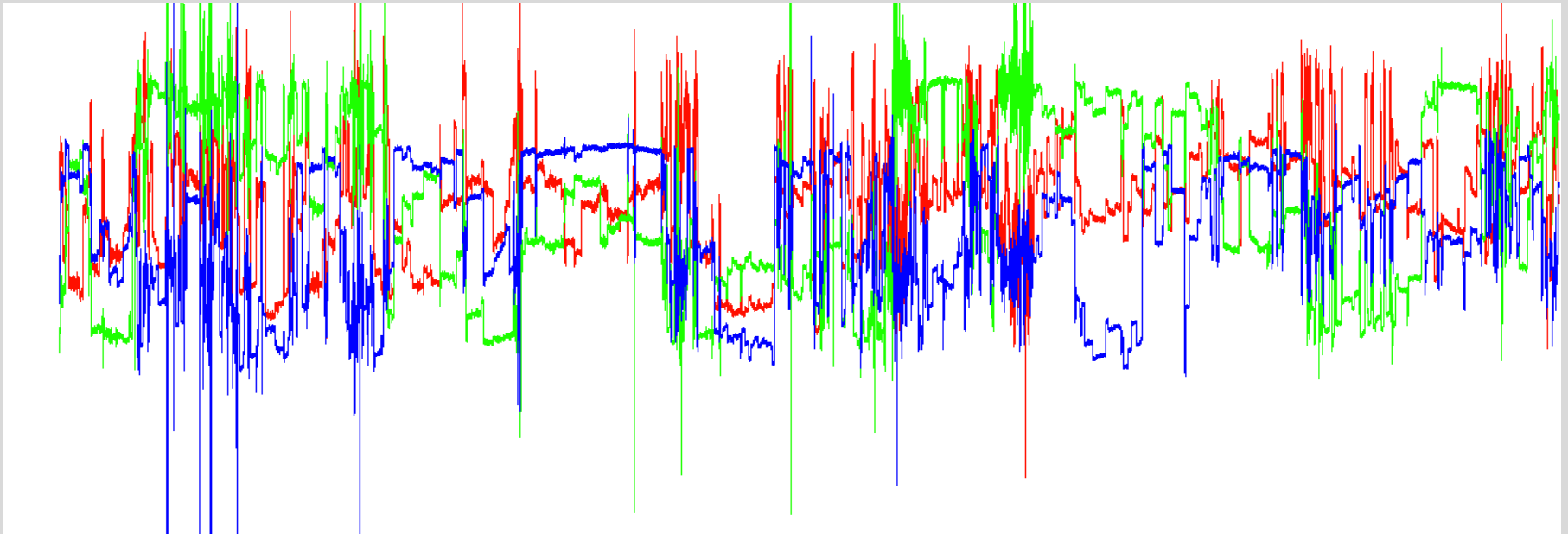
Initial data – begins during anesthesia recovery

Daily Activity patterns (from ODBA)

Possum starts activity later and continues all night. Raccoon starts earlier but has midnight rest followed by early AM pulse (bimodal)
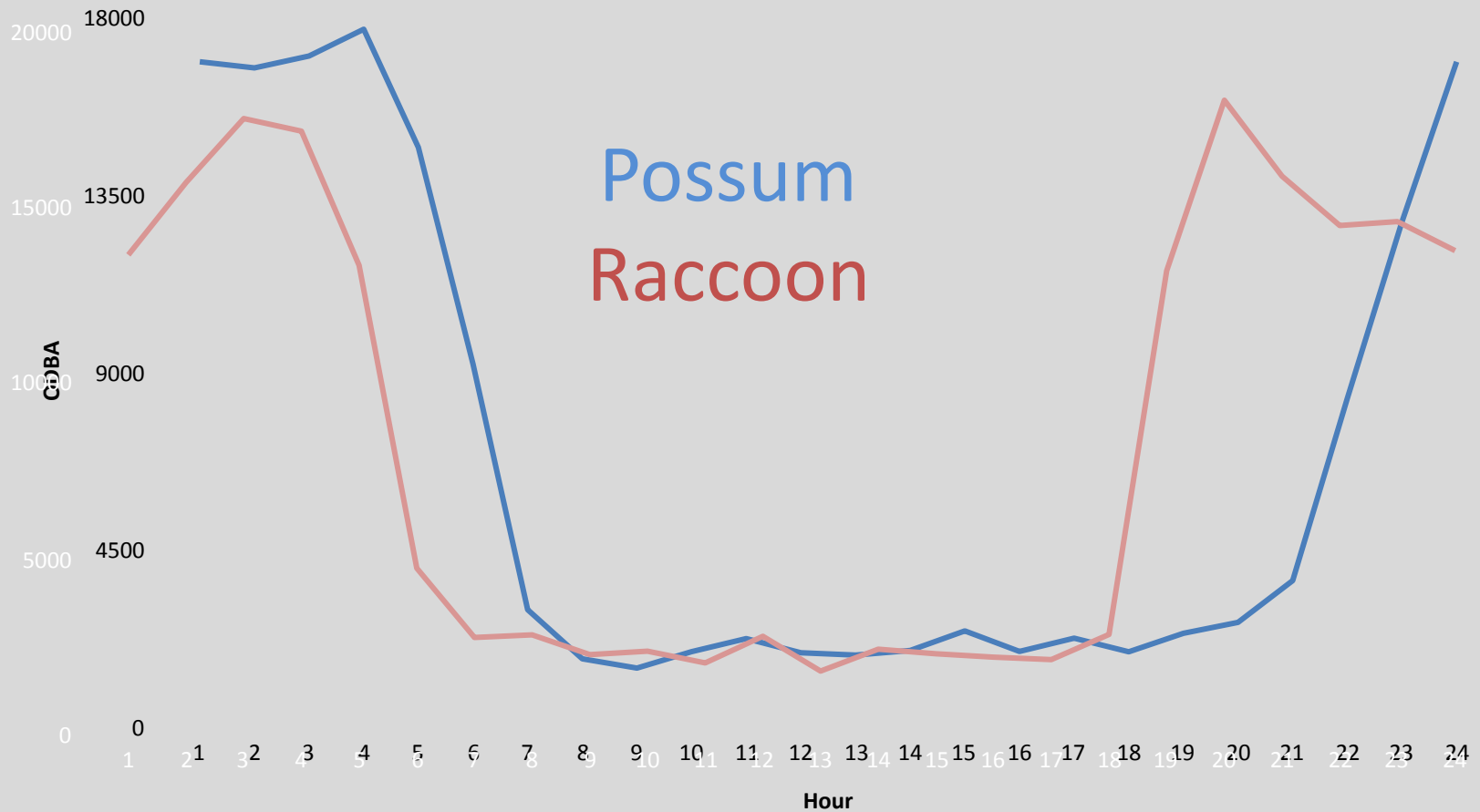
Opossum active period length over time

Active Period
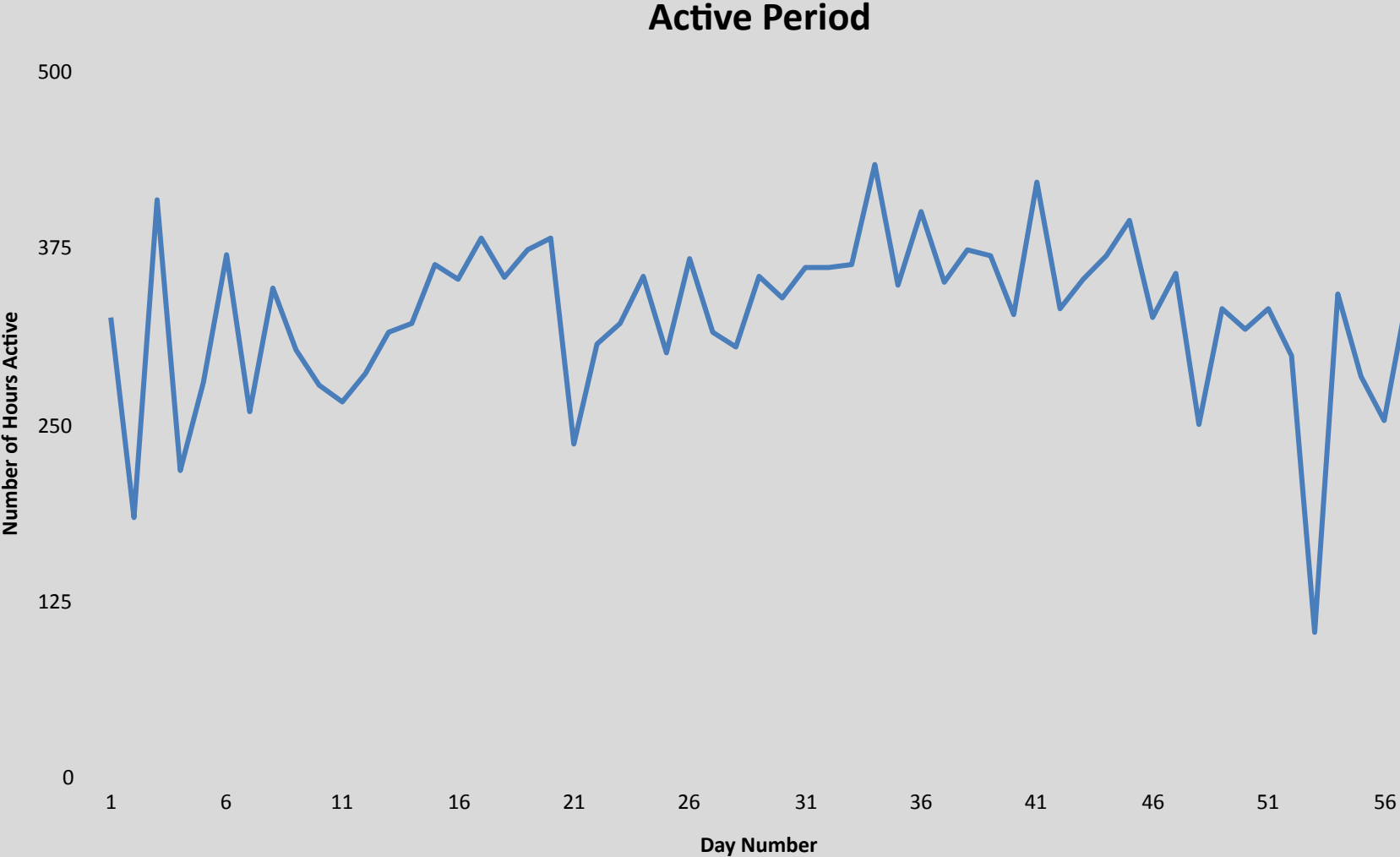
Male raccoon start and end of activity vs. sunset and sunrise
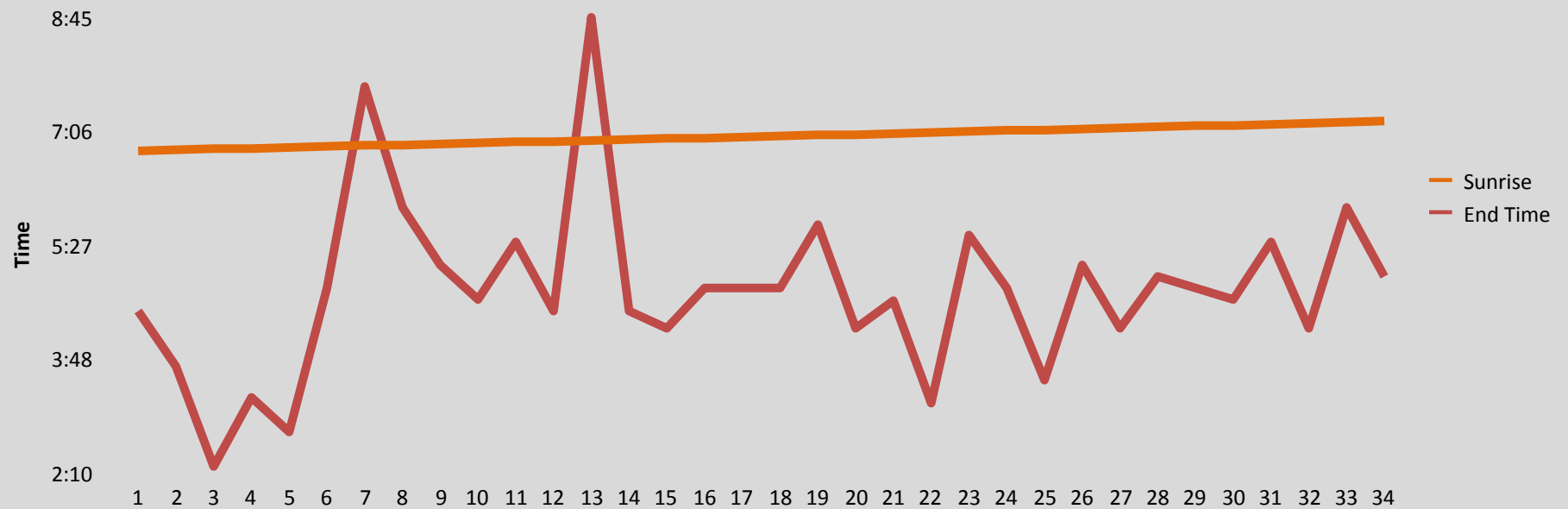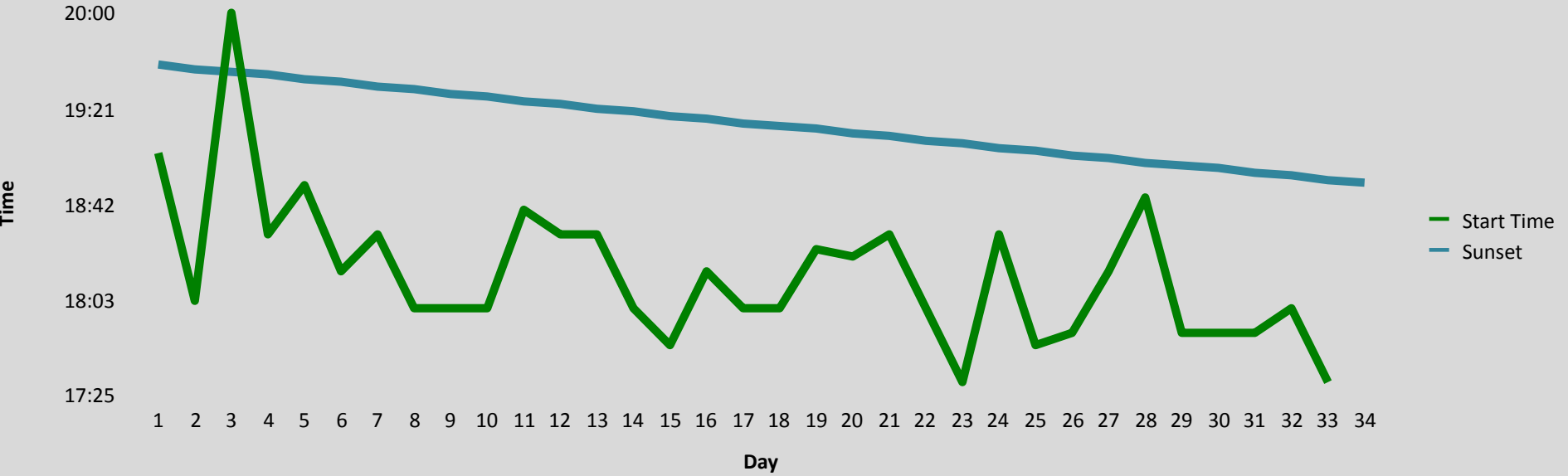
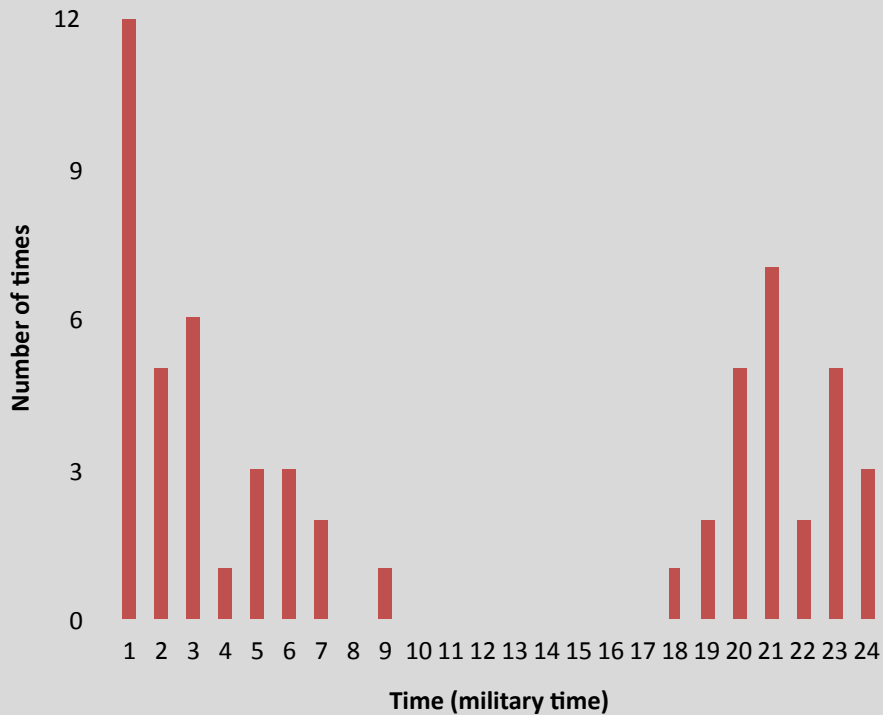Female raccoon start and end of activity vs. sunrise and sunset
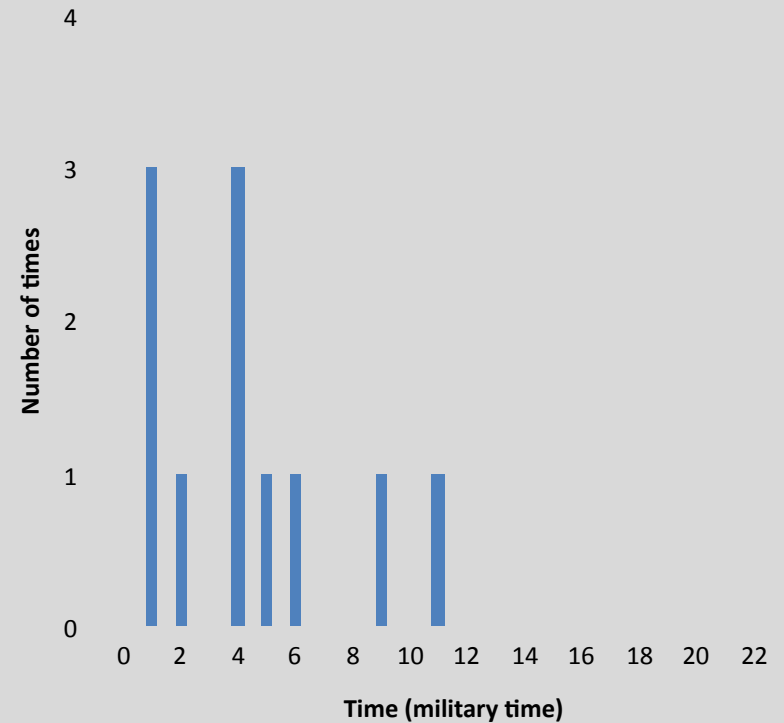Pushes activity much closer to dawn than the male
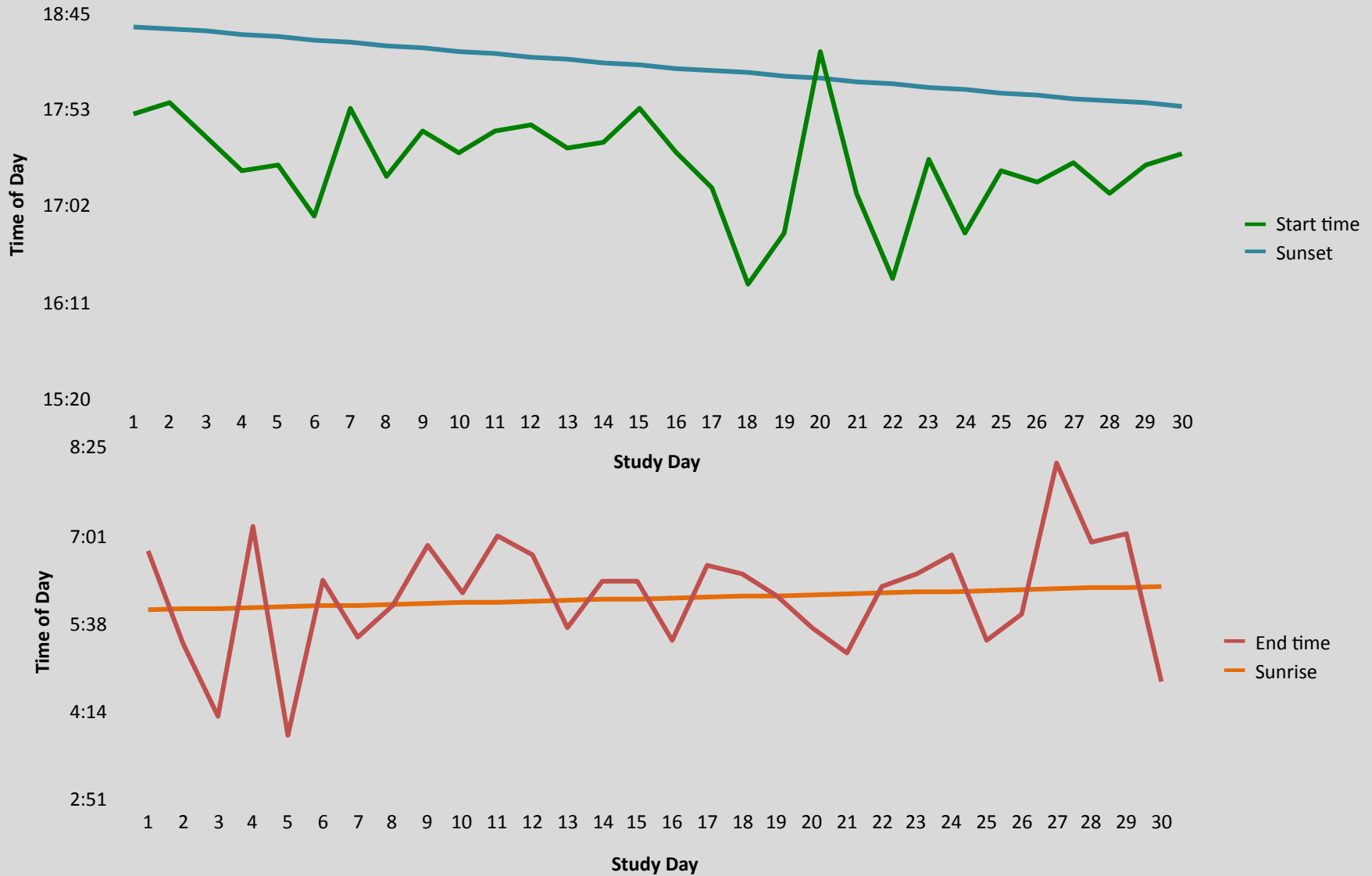
Time of day they crossed roads
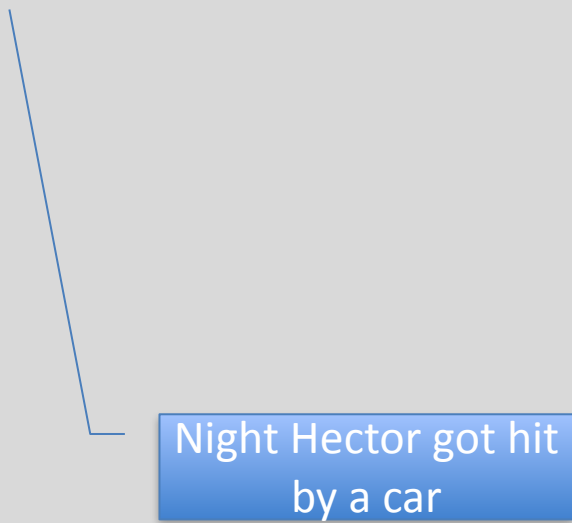## No avoidance of busy periods by raccoon, but some by possum
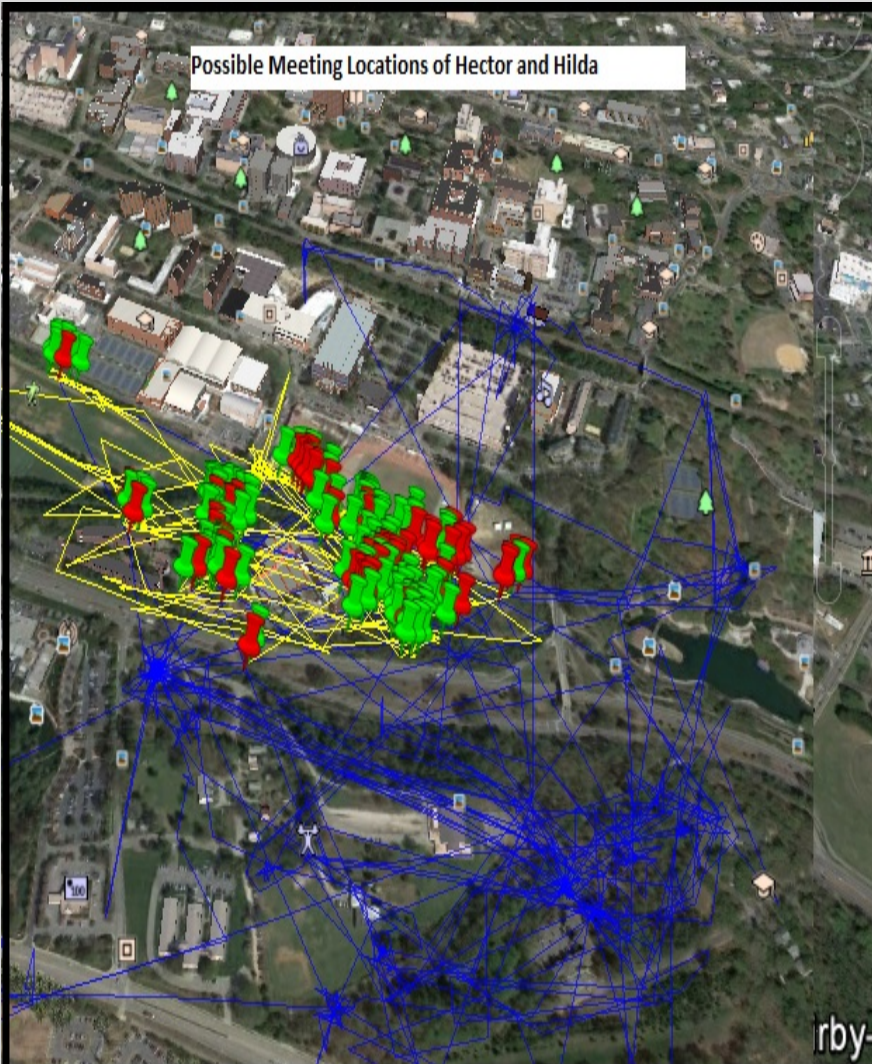
Male Raccoon
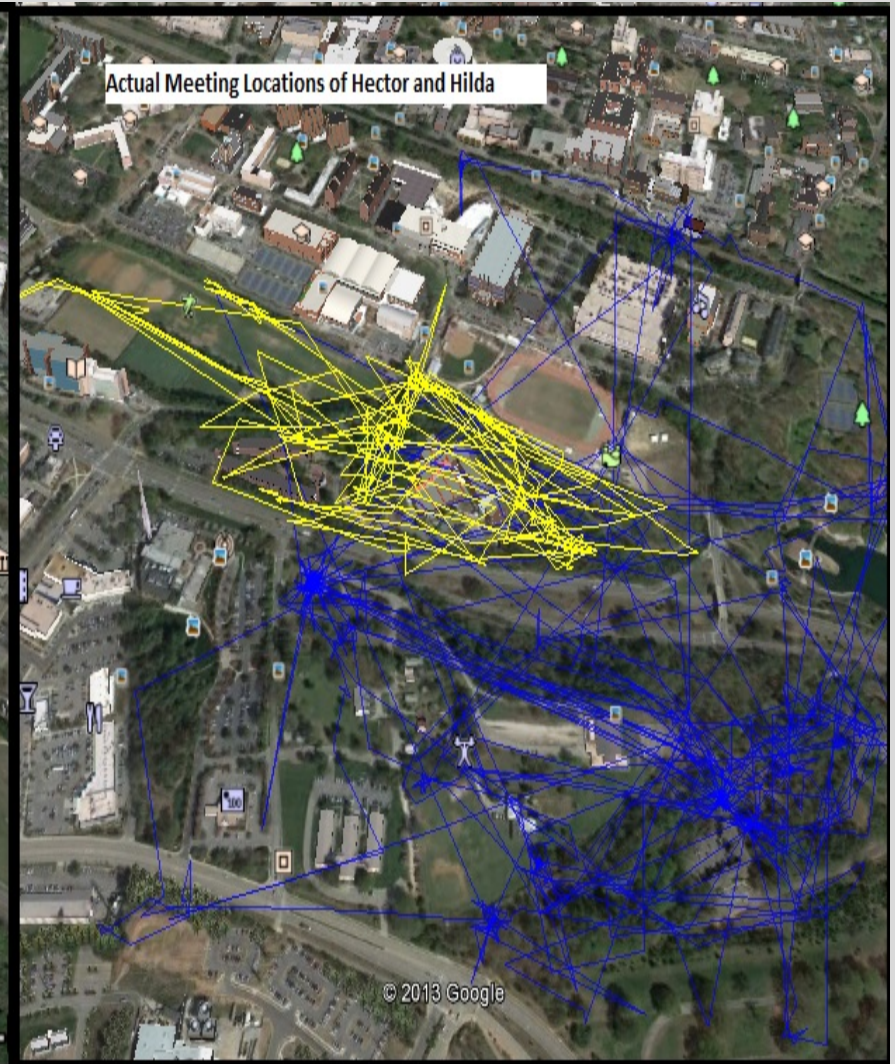
Female Possum

Total Daily Movement
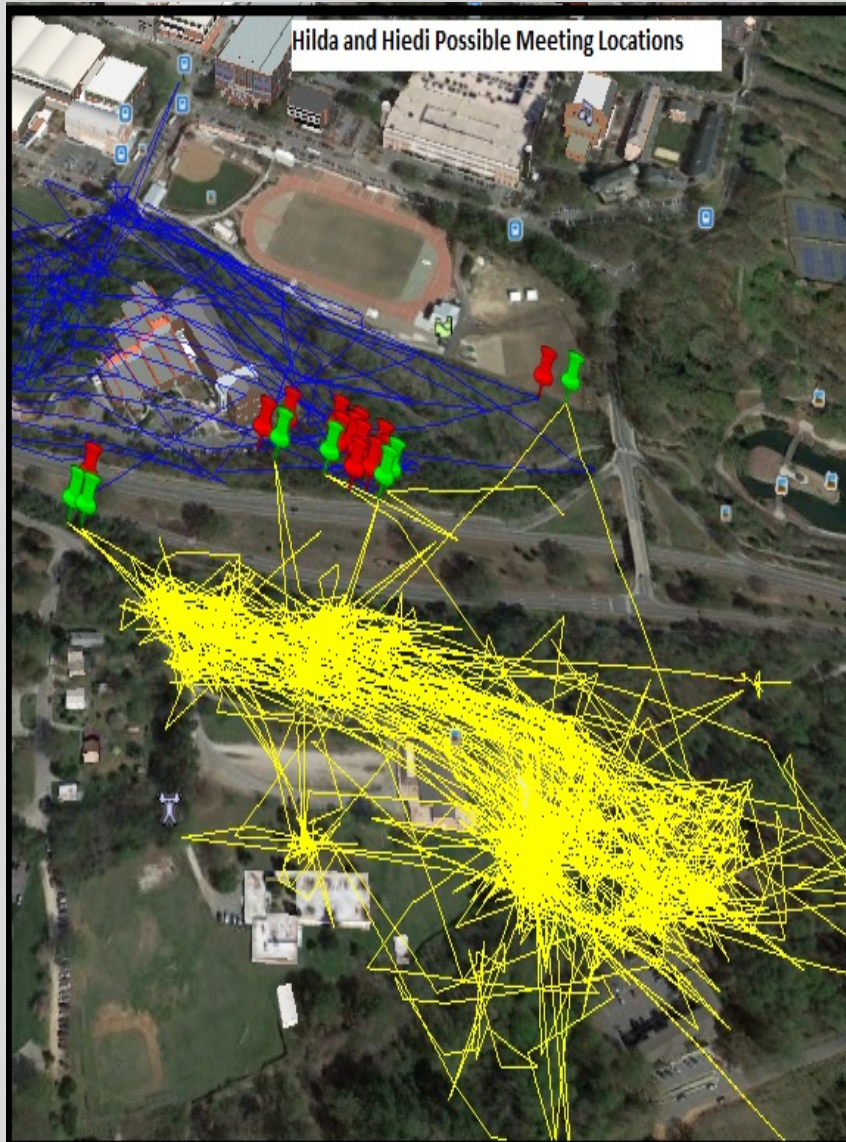
Night Hector got hit
by a car

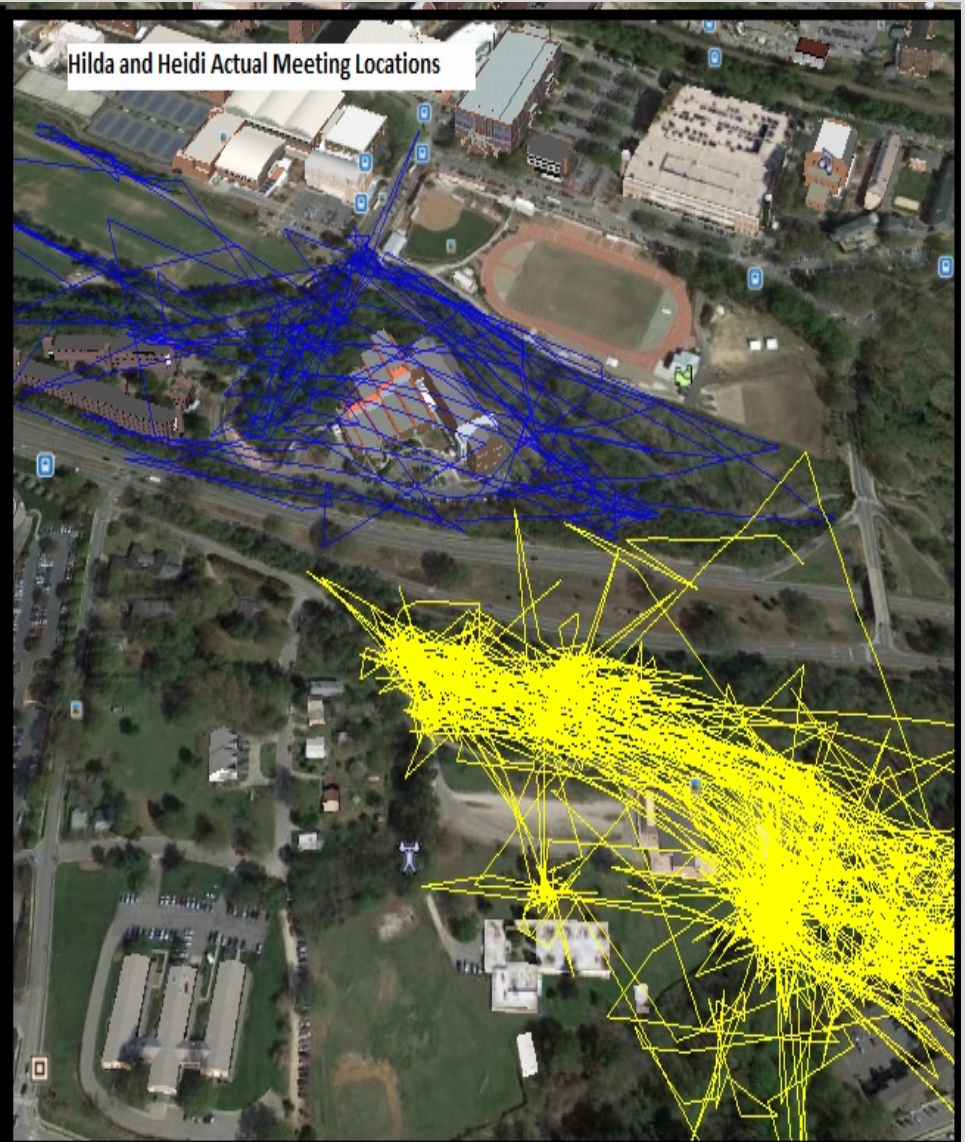# Possible Meeting Locations of Hector (raccoon) and Hilda (Opossum)

Actual Meeting Locations of Hector (Raccoon) and Hilda (Opossum): NONE

Possible Meeting Locations for Hilda and Heidi

Actual Meeting Locations for Hilda and Heidi: NONE

Hilda and Hiedi Possible Meeting Locations

Hilda and Heidi Actual Meeting Locations

Heidi (Raccoon) and Hector (Raccoon) Actual Meeting Locations